

NON-PUBLIC?: N  
ACCESSION #: 8804200195  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: North Anna Power Station, Unit 1 PAGE: 1 of 4

DOCKET NUMBER: 05000338

TITLE: Turbine Trip/Reactor Trip - EHC System Malfunction  
EVENT DATE: 03/19/88 LER #: 88-013-00 REPORT DATE: 04/14/88

OPERATING MODE: 2 POWER LEVEL: 000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: G. E. Kane, Station Manager TELEPHONE #: 703-894-5151

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: At 0133 hours on March 19, 1988, Unit 1 experienced an automatic reactor trip from approximately 3.5 percent power, 0 MWe. The reactor trip occurred due to a spike in the turbine impulse (first stage) pressure which caused a turbine trip and enabled the logic for a reactor trip when a turbine trip condition existed. This event is reportable pursuant to 10CFR50.73 (A)(2)(iv).

The turbine impulse pressure spike occurred while placing the turbine in operation. Internal bypass leakage in the Electro-Hydraulic Fluid Control System (EHC) was believed to have occurred in the servo control valves and valve actuators which control the position of the turbine governor valves. The increased bypass leakage allowed the turbine governor valves to close and resulted in a decrease in turbine impulse pressure. A second EHC pump was started to increase the EHC fluid pressure and reopen the turbine control valves. The reopening of the turbine control valves caused the impulse pressure to exceed the setpoints for a turbine trip if the generator output breaker is open and for a reactor trip from a turbine trip.

As a corrective action, the servo control valves for the four governor valves were replaced and tested satisfactorily.

This event posed no significant safety implications since safety related equipment responded as designed and key reactor parameters

stabilized at their normal values following the reactor trip. The health and safety of the public were not affected.

(End of Abstract)

TEXT: PAGE: 2 of 4

## 1.0 Description of Event

At 0133 hours on March 19, 1988, Unit 1 experienced an automatic reactor trip from approximately 3.5 percent power, 0 MWe. The reactor trip occurred due to a spike in the turbine impulse (first stage) pressure (EIS System Identifier IT, Component Identifier PR) which caused a turbine trip and enabled the logic for a reactor trip when the turbine trip condition existed. This event is reportable pursuant to 10CFR50.73 (A)(2)(iv).

The trip occurred while the turbine was being placed in operation in accordance with 1-OP-15.1, "Main Turbine Operation". While preparing to transfer the turbine speed control from throttle valve control to governor valve control, the operator observed that the throttle valves (EIS System Identifier TA, Component Identifier SHV) were fully open while the governor valves (EIS System Identifier TA, Component Identifier FCV), reheat stop valves (EIS System Identifier TA, Component Identifier SHV), and intercept valves (EIS System Identifier TA, Component Identifier SHV) had closed and the turbine speed was decreasing. The governor, reheat stop and intercept valves should have been fully open and the throttle valves partially opened to control turbine speed at 1700 rpm.

The operator lowered the governor valve position limiter to limit the opening of the governor valves since the throttle valves were fully open. The valve position limiter was reduced to 20% when the EHC fluid pressure reached its low pressure alarm setpoint (1600 psig) and the operator manually started the backup EHC pump (EIS System Identifier TG, Component Identifier P). After the second pump was started, the EHC pressure increased and reopened the turbine governor valves, reheat stop valves and intercept valves. Since the throttle valves were open, the turbine impulse pressure spiked from 0 psig to approximately 95 psig which is equivalent to approximately 16 percent turbine load.

When the turbine impulse pressure exceeded the equivalent of 15 percent turbine load with the main generator output breaker open, the turbine tripped as designed. The reactor trip on turbine trip was enabled when the turbine impulse pressure exceeded the equivalent of 10 percent load (P-13 permissive) which cleared the low power reactor

trip block (P-7 permissive).

The reactor trip occurred as designed. The reactor trip response procedures were performed and safety related and important equipment performed as expected.

TEXT: PAGE: 3 of 4

Following the reactor trip the primary system pressure and temperature decreased to approximately 2190 psig and 543 degrees F, respectively. The reduction in primary system temperature was due to an increase in steam generator levels, with the highest level reaching 49 percent, narrow range. The feedwater flow to the steam generators was reduced and the reactor coolant system recovered to the normal no load conditions of 2235 psig and 547 degrees F.

## 2.0 Safety Consequences and Implications

This event posed no significant safety implications since safety related equipment functioned as designed and the reactor coolant system parameters stabilized at their normal post trip values. There was no release of radioactive materials due to the trip. The health and safety of the public were not affected.

## 3.0 Cause of the Event

The automatic turbine and reactor trip occurred as expected when the turbine impulse pressure exceeded the equivalent of 15 percent turbine power with the main generator output breaker open and the P-7 permissive was cleared. The impulse pressure spike was a result of the reopening of the governor valves upon increasing the EHC pressure as previously described.

## 4.0 Immediate Corrective Action

As an immediate action, Emergency Procedure EP-O, "Reactor Trip or Safety Injection", was entered and the plant was stabilized in Mode 3.

## 5.0 Additional Corrective Action

The EHC system was tested using a Special Test procedure to determine the cause of the decrease in EHC fluid pressure which allowed the turbine control valves to close. This test demonstrated that two of the servo control valves (EHS System Identifier JJ, Component Identifier PCV) used to control the position of the governor valves had abnormal bypass

leakage. Internal leakage within the control valve actuators may have contributed to the low EHC system fluid pressure. The servo control valves for the four governor valves were replaced.

The automatic start capability of the standby EHC pump was also tested to confirm that it would automatically start when the EHC fluid pressure decreased to the setpoint. During the testing, the pressure at which the pump started was not consistently within the required range of 1400 plus or minus 28 psig. The pressure switch (EHS System Identifier TG, Component Identifier PS) controlling the automatic start function was replaced and calibrated. Subsequent tests confirmed that the backup pump automatically started at the specified EHC fluid pressure.

TEXT: PAGE: 4 of 4

## 6.0 Actions Taken to Prevent Recurrence

The tests conducted following the replacement of the servo control valves demonstrated that the EHC system fluid pressure was maintained at acceptable levels and that the turbine control valves were operable. The maintenance department will perform an evaluation to determine whether inspection and maintenance of the turbine control valve actuators is warranted during the next refueling outage.

## 7.0 Similar Events

On January 19, 1986, Unit 1 experienced an automatic reactor trip/turbine trip from 4 percent power due to a turbine impulse pressure spike which occurred during preparation to conduct a turbine-generator overspeed trip test. This event was reported under LER 86-001-00.

On November 18, 1984, Unit 1 experienced an automatic reactor trip/turbine trip from 3 percent power due to a turbine impulse pressure spike which occurred during performance of the overspeed protection controller test. This event was reported under LER-84-020-00.

## 8.0 Additional Information

Unit 2 was in Mode 1 at 100 percent power during this event and was not affected.

ATTACHMENT # 1 TO ANO # 8804200195 PAGE: 1 of 1

10 CFR 50.73

VEPCO

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION  
P.O. BOX 402  
MINERAL, VIRGINIA 23117

April 14, 1988

U. S. Nuclear Regulatory Commission Serial No. N-88-014  
Attention: Document Control Desk NO/BLS: nih  
Washington, D.C. 20555 Docket No. 50-338

License No. NPF-4

Dear Sirs:

The Virginia Electric and Power Company hereby submits the following  
Licensee Event Report applicable to North Anna Unit 1.

Report No. LER 88-013-00

This report has been reviewed by the Station Nuclear Safety and Operating  
Committee and will be forwarded to Safety Evaluation and Control for their  
review.

Very Truly Yours,

/s/ G. E. Kane

G. E. Kane

Station Manager

Enclosure

cc: U.S. Nuclear Regulatory Commission  
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Mr. J. L. Caldwell  
NRC Senior Resident Inspector  
North Anna Power Station

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